CLAIMS

1. An electrochemical sensor for measuring the amount of hydrogen sulphide or thiols in a fluid, the sensor comprising a housing having a flow path for the fluid therethrough, a substantially rigid gas permeable membrane disposed in the housing and having one side exposed to the flow path, and a chamber disposed in the housing, the chamber being exposed to the other side of the membrane and containing reagents which together with the hydrogen sulphide or thiols entering the chamber via the membrane create a redox reaction resulting in an electrical current dependent upon the amount of hydrogen sulphide or thiols in said fluid

2. The electrochemical sensor as claimed in claim 1, wherein the housing is provided with pressure balancing means for reducing the difference between the respective pressures on each side of the membrane.

3. The electrochemical sensor as claimed in claim 2, wherein the pressure balancing means comprises a movable piston having a first pressure surface in pressure communication with the flow path and a second pressure surface in pressure communication with the chamber.

4. The electrochemical sensor as claimed in claim 3, wherein the first pressure surface of the movable partition, piston or bellow is directly exposed to the fluid, and the second pressure surface of the movable piston is directly exposed to the reagents.

5. The electrochemical sensor as claimed in any preceding claims, wherein the membrane is trapped between respective sealing means which extend around the periphery of the membrane on each side thereof.

6. The electrochemical sensor as claimed in any preceding claims, wherein the housing includes a first housing member which is generally cup-shaped and is provided with a centrally disposed aperture in its base, and a second housing member which is substantially cylindrical and screws coaxially into the cup-shaped housing member so as to trap the membrane between the end of the second housing member within the first housing member and the base of the cup shape of the first housing member, said other side of the membrane completely covering said aperture, and the flow path extending transversely through both housing members and communicating with said one side of the membrane via a coaxially disposed conduit in the second housing member.

7. The electrochemical sensor as claimed in claim 6, the housing includes a third housing member having a generally cylindrical recess for coaxially receiving the first and second housing members so as to define therewith a cylindrical space between the base of the cup shape of the first housing member and the base of the recess, said cylindrical space forming at least part of the chamber.

8. The electrochemical sensor as claimed in claim 6 or claim 7, wherein the sealing means on said other side of the membrane comprises a substantially coaxially disposed O-ring trapped between said other side of the membrane and

the base of the cup shape of the first housing member, while the sealing means on the one side of the membrane comprises sealing engagement between said one side of the membrane and a planar surface formed on the end of the second housing member within the first housing member.

9. The electrochemical sensor as claimed in any one of claims 6 to 8, wherein a further coaxially disposed O-ring is trapped between the base of the cup shape of the first housing member and the base of the recess.

10. The electrochemical sensor as claimed in any preceding claim, wherein the chamber includes a working electrode, a counter electrode and a reference electrode.

11. The electrochemical sensor as claimed in claim 10, wherein the electrodes are spaced apart in the chamber and arranged such that said current flows between the working and counter electrodes.

12. An electrochemical sensor as claimed in claim 11, wherein the working electrode is made from boron-doped diamond.

13. An electrochemical sensor as claimed in claim 11, wherein the working electrode is made from glassy carbon.

14. An electrochemical sensor as claimed in claim 11, wherein the working electrode is made from platinum.

15. The electrochemical sensor as claimed in any one of claims 10 to 14, wherein the counter electrode may be made of platinum.

16. The electrochemical sensor as claimed in any one of claims 10 to 15, wherein the reference electrode is made of silver coated with silver chloride or silver iodide, or platinum.

17. The electrochemical sensor as claimed in any one of claims 10 to 16, wherein the electrodes are mounted on or in an insulating base made from polyetheretherketone.

18. The electrochemical sensor as made in any preceding claim, wherein the housing members are made from polyetheretherketone.

19. The electrochemical sensor as claimed in any preceding claim, wherein the reagents include dimethylphenylenediamine or its structural analogues.

20. The electrochemical sensor as claimed in any one of preceding claims, wherein the reagents include an aqueous ferrocyanide or ferrocene solution.

21. The electrochemical sensor as claimed in any preceding claims, wherein the membrane is made from zeolite or a suitable ceramic material.

22. The electrochemical sensor as claimed in any preceding claims, equipping a wellbore tool and wherein the fluid is a formation fluid.

23. The electrochemical sensor as claimed in claim 22, wherein the wellbore tool is provided with a sampling probe, said sampling probe being located at a distance comprised between 8 and 30 cm from said electrochemical sensor.

24. A method of measuring the amount of hydrogen sulphide or thiols in formation fluid from an earth formation surrounding a wellbore, the method comprising positioning a downhole tool equipped with an electrochemical sensor in accordance with any preceding claim in the wellbore adjacent to the formation, exposing the sensor to the formation fluid, and measuring the current produced by the sensor.